How to Perform a Viewshed Analysis in ArcGIS for Desktop

Training

This tutorial will show you how to perform a viewshed analysis utilizing the LiDAR Image Services located at: http://lidar.geodata.md.gov/imap/rest/services. This analysis, using ArcGIS for Desktop, requires Spatial Analyst extension.

What is a viewshed analysis?

A viewshed is the area visible from a specific location. The analysis uses the elevation value of each cell from a DEM (digital elevation model) to determine the visibility from a particular cell or observation.

When is a viewshed analysis appropriate?

Viewshed analyses are used to determine visibility to and from particular observation locations. Some examples may include determining visibility from roads, trails and fire observation stations.

Users who require the raw data, countywide DEMs are available for download from the MD iMAP LiDAR Download page.

First we will need to connect to the MD iMAP Maryland LiDAR Topography Server, for more information please follow this link to learn How to Access Maryland LiDAR Image Services.

Tutorial Scenario

For this tutorial, we are tasked with assisting in a visibility assessment for a theoretical proposed look-out structure in Savage River State Forest, Garrett County.

This proposed structure will be 15 meters tall and located at coordinates

(-79.12253, 39.520649).

Before the plan is finalized, investors want to ensure the structure will have a good view of the Savage River Reservoir below.

We will need to generate a point feature for the proposed structure and attribute appropriately to perform our viewshed analysis.

When the observer is a point feature class, it can hold a unique set of constraints. In this particular scenario, we will add a field to the table; "OFFSETA", indicating the elevation of the observation structure.

1. Open ArcMap

2. Check out Spatial Analyst Extension:

3. Add the desired Image Service to your map (MD_garrett_DEM_m).
   For more information on accessing Maryland LiDAR image services,
   please read How to Access Maryland LiDAR Image Services.
   *Note: Raster functions are only available for the [DEM_M] services within each county folder.*

4. Click "Go To XY" [XY]

5. Enter coordinates (-79.12253, 39.520649) and "Add Point" to the map [ ].
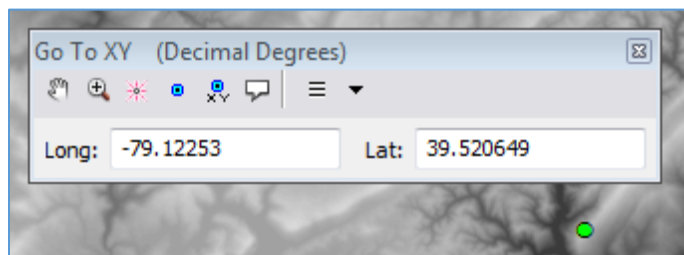
6. Extract your AOI (area of interest) from the image service to allow for local data processing. For more information on the image service extraction process, please read How to Extract from Image Services in ArcGIS for Desktop.
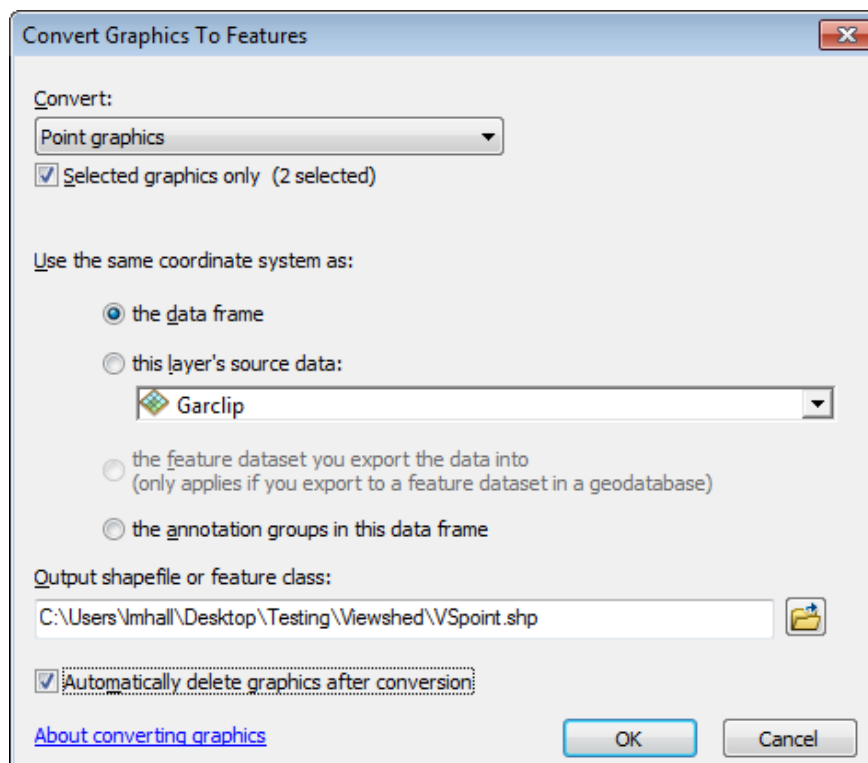
   For this tutorial, clip a region from the Garrett County DEM_m image service surrounding our XY location >>>
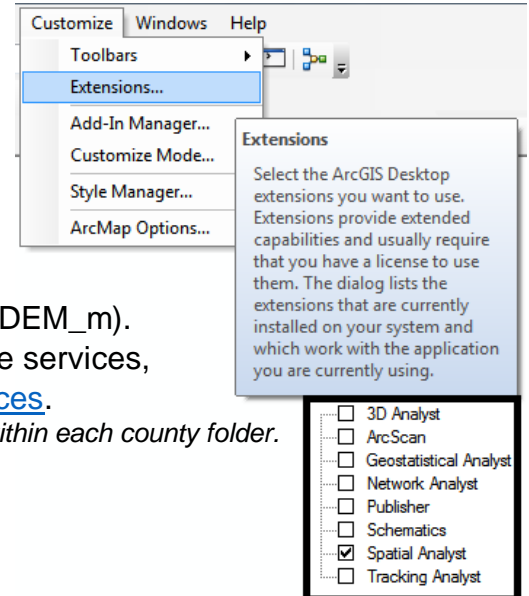
7. From your drawing toolbar, select the dropdown and "Convert Graphics to Features".
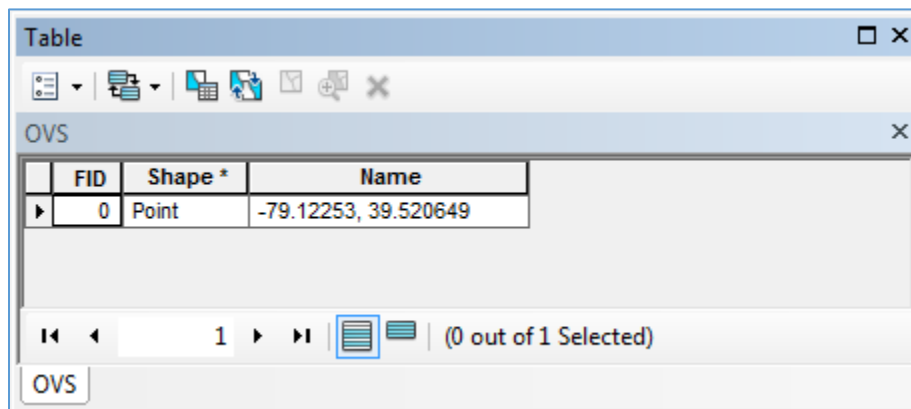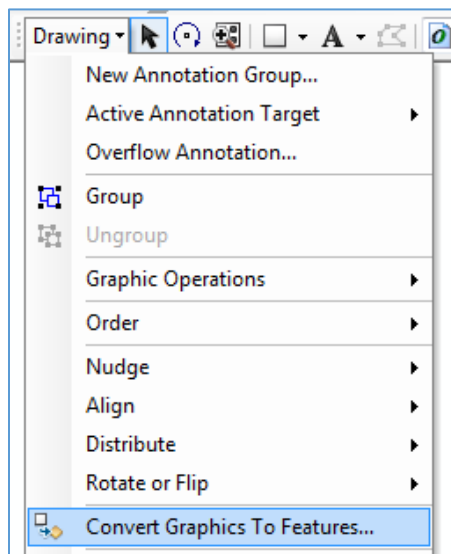

8. Set your output shapefile or feature class;
   Check the box to "Automatically delete graphics after conversion".

Click [OK].

9. Open attribute table for new point feature:

10. Open the attribute table options [ ]
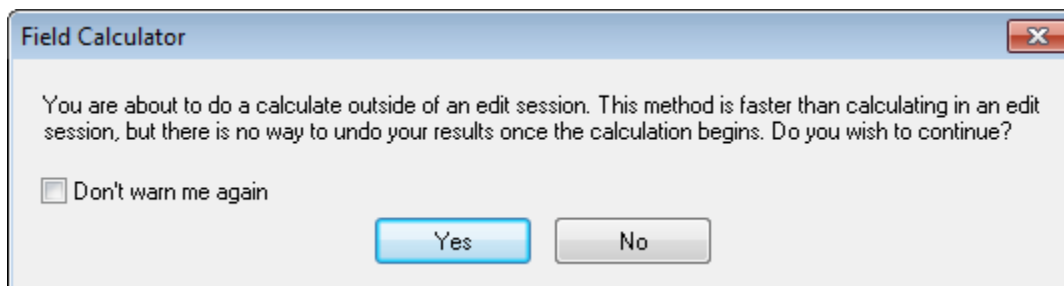   "Add Field…"

11. Name the field: "OFFSETA"
    Note: the field name has to be written in capital letters, exactly as soon above…
   Type: Short/Long Integer.
    Click [OK].

12. Right click the field "OFFSETA" in your attribute table and select "Field Calculator".
    If you are outside of an editing session, you may see the following screen:

Click [Yes] to calculate the field outside of an editing session.
It is good practice to start editing session when calculating multiple rows of data, however we in this scenario we have a single row that needs to be calculated so it is unnecessary

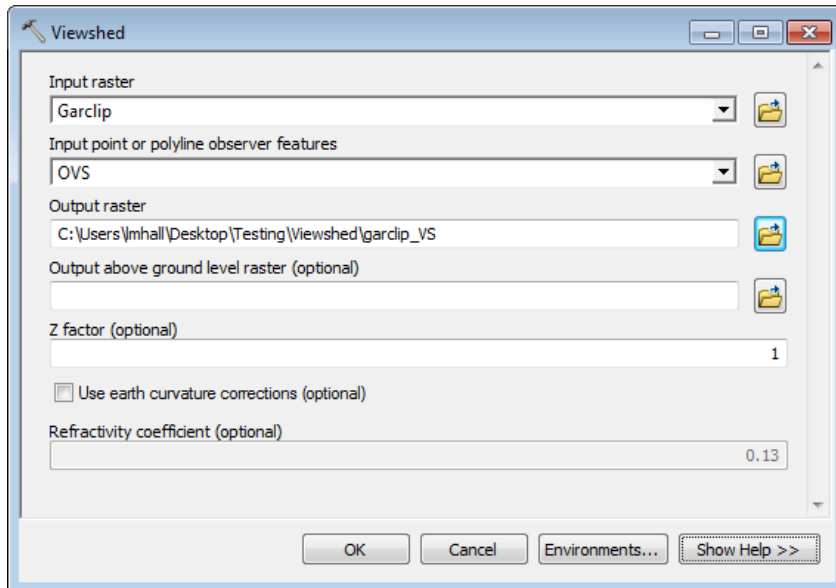13. Set OFFSETA = 15 in your expression line of the "Field Calculator"
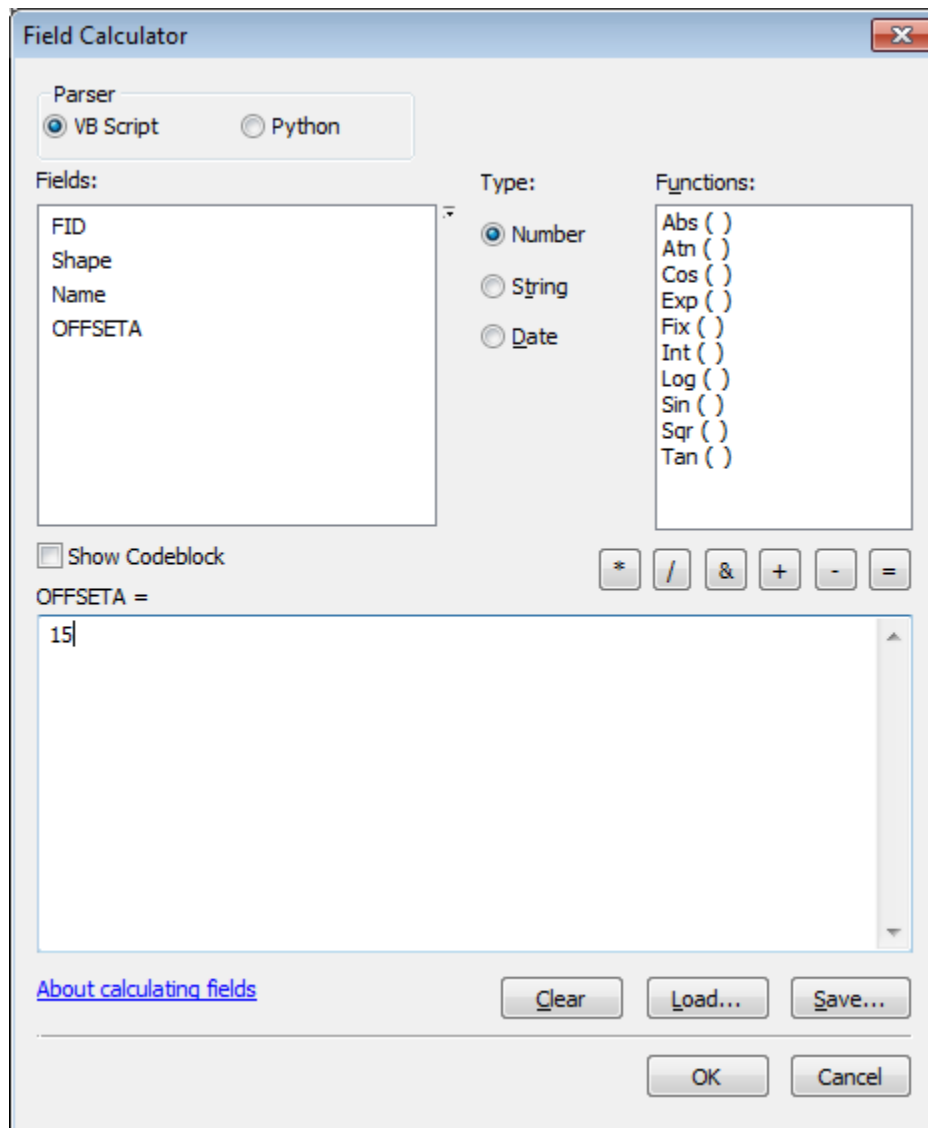
Click [OK].

14. Close attribute table

15. Search for tool, "Viewshed" (Spatial Analyst)

16. Input the raster DEM and point observation feature.
    Select the output location and raster name.

    Optional check box for earth curvature corrections; (leave unchecked for this tutorial)

17. The results from the viewshed analysis are as follows:

    The green cells are visible from the observation point at 15m above the surface.
    The pink cells are not-visible from the observation point at 15m above the surface.
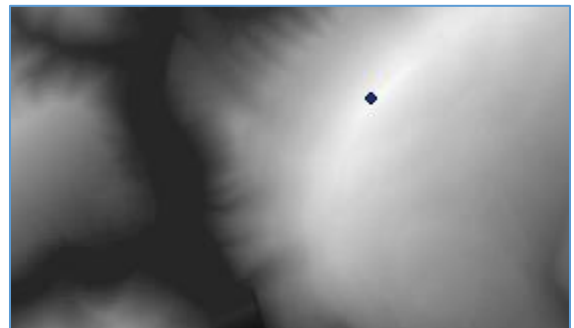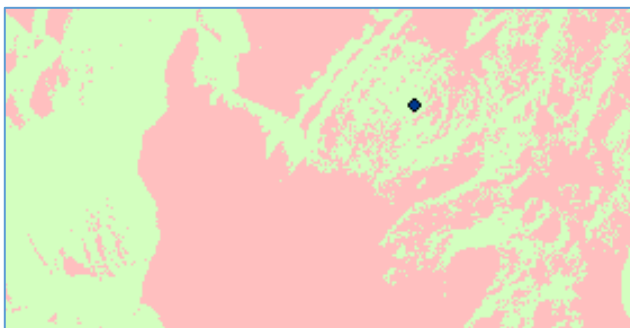
18. If we compare our viewshed output with the DEM, we notice that the river to the southwest of the observation point will likely not be visible with a 15m observation lookout.

    In our theoretical scenario, officials can now determine whether enough of the river is visible to justify construction, or they can consider building the observation point taller than 15m or relocating to a more suitable location.

ADDITIONAL RESOURCES

For more information about Maryland LiDAR, please visit the Maryland LiDAR Overview page

For more information about additional training opportunities, please visit the MD iMAP Training Overview page, or contact Lisa Lowe, Senior GIS Analyst with the Maryland Department of Information Technology, Geographic Information Office at lisa.lowe@maryland.gov.

For additional MD iMAP datasets, please visit the GIS Data Catalog

For all other inquiries related to Maryland LiDAR, please contact the GIO Office at service.desk@maryland.gov.